NWPMA Condition Survey Committee
January 8, 2002
Modified PAVER presentation

History of Method

Many of the local agencies in Washington currently use a rating procedure that is referred to as the extended WSDOT rating system (WSEXT). This procedure uses the current rating manual and provides an analysis procedure for the distresses contained in the manual. It provides the ability to measure the extent of the various distress types in greater detail and thus allow for the use of continuous deduct curves. This system uses the PAVER/ASTM system and associated deduct curves with some changes. These include:

1. Transverse and longitudinal cracking is rated as two separate distresses
2. A separate longitudinal fatigue crack distress type is included.
3. Utility patching is included as a separate distress
4. Crack seal inventory/rating is included
5. Raveling (weathering) and Flushing (bleeding) are rated using a discrete rating matrix.
6. Rutting extent is assumed to be the full segment area and average depth/severity is recorded.

This system is currently being used by most of the larger Cities and Counties within the State and was developed out of an attempt by state and local agencies to establish a statewide standard rating system.

Distress Types, Severity Definitions and Extent Measures for Pavement Surface Condition Field Manual for Asphalt Pavement

he following is a summary of each pavement distress type and its quantification in terms of severity (how bad the distress is) and extent (over what area/length does it exist).

1. Rutting and Wear

Severity:	Average Rut Depth over the segment. Low – ¼-inch to ½-inch Med – ½-inch to ¾- inch High – over ¾-inch
Extent:	Assume full segment length.
Measure:	Take measurements in as many locations as is practical and average them
Comments:	Use sags and humps for localized rutting.

2. Fatigue (Alligator) Cracking

Severity: (Crack size and Pattern)

Low	Branching inner connecting longitudinal cracks.
Medium	Fully developed alligator pattern with some spalling
High	Severe spalling and pumping

Extent: The area of each severity in sq. units.

3. Longitudinal Cracking - Fatigue Related

Severity:	Low	Less than	¼ inch crack wide
	Medium	Greater than	¼ inch crack wide.
	High	Greater than	¼ in. Spalled cracks.
Extent:	The length of each severity in length units		
Comments:	Fatigue caused longitudinal cracks are the early or first stage of distress #2. These cracks have a distinct broken pattern and occur in the wheel path.		

4. Nonwheel Path Longitudinal Cracking Same as #3

Comments: This distress tends to be straighter and has more distinct cracks than longitudinal fatgue/alligator cracks. If the crack is in the wheelpath, record as #3, Longitudinal Cracking -- Fatigue

5. Transverse Cracking - Same as #3

Comments: Include localized alligator cracking in the transverse direction as high transverse cracks.

6. Raveling

Severity:	Low	Binder &/or aggregate has started to wear away.
	Medium.	Binder &/or aggregate has worn away and is rough.
	High	Surface texture is deeply pitted.
Extent:	Localized	= 1 – Patchy Areas usually in the wheel paths.
	Wheel paths little elsewhere	= 2 – Majority of both wheel paths are fully raveled but
	Entire lane	= 3 – Most of the lane is affected.
Comments:	Estimate the severity and extent.	

7. Flushing or Bleeding

Severity:	Low	Minor amount of aggregate is covered
	Medium	Significant amount of aggregate is covered
	High	Most of the aggregate is covered
Extent:	Localized	= 1 – Patchy Areas usually in the wheel paths.
	Wheel paths little elsewhere	= 2 – Majority of both wheel paths are fully raveled but
	Entire lane	= 3 – Most of the lane is affected.
Comments:	Estimate the Severity and Extent.	

8. Patching – Maintenance -

Severity:	Low	Patch has at most low severity distress of any type.
	Medium	Patch has medium severity distress of any type.
	High	Patch has high severity distress of any type.
Extent:		Entry the area in square feet..
Comments:	Utility patching is rated separately.	

9. Original WSDOT Patching:

Severity:	Low	BST or chip seal patch.
	Medium	Blade Patching.
	High	Digout or Full Depth Patch.
Extent:		1-9% of both wheel paths
		10-24 % of both wheel paths
		25% or more of both wheel paths
Comments:	Not used by many local agencies.	

10. Corrugations and Waves

Severity:	Low	1/8 in. to 2 in. change per 10 feet.
	Medium	2 in. to 4 in. change per 10 feet.
	High	Over 4 in. change per 10 feet.

Extent: Enter the area in square units for each severity.

11. Sags and Humps - Same as #10

12. Block Cracking

Severity:	Low	9x9 foot and larger blocks.
	Medium	5x5 to 9x9 foot blocks.
	High	Greatet then 9x9 foot blocks.
Extent:	Assumed full length of sample area.	

13. Edge Condition

Severity:	Low	= Edge Raveling
	Medium	= Edge Patching
	High	= Lane less than 10 feet
Extent:		1-9% of segment length
		10-24 % of segment length
		25% or more segment length

Comment: Accumulate the lengths along the surveyed lane of each type of edge defect as it occurs. Divide the accumulated lenths by the length of the segment. Multiply by 100 to get percent and round to a whole number.

14. Crack Seal Condition

Severity:	None	There are no sealed cracks
	Low	Crack sealant is in good condition.
	Medium	Crack sealant is open and allows water into crack.
	High	Crack sealant is missing or non-existent.
Extent:		1-9% of total length of cracks or joints
		10-24 % of total length of cracks or joints
		25% or more of total length of cracks or joints

Comments: Count or estimate and accumulate the length of cracks and joints that exhibit each severity of seal condition. Count or estimate the total length of cracks and joints in the segment. Divide each of the accumulated lengths of condition by the total length of cracks and joints, multiply by 100 and round to a whole number.

Common Modifications to the Condition Survey Manual entitled "Pavement Surface Condition Field Manual for Asphalt Pavement"

A number of modifications to the current manual have been employed by local agencies in Washington state. The following include several modifications that the presenters are aware of. The presenters suggest that the committee determine other common modifications being employed by local agencies in the state.

A. Modifications in the current Centerline Condition Survey Manual (note some of these are clarifications of information which could be interpreted one way or another in the current manual.)

2. Rutting and Wear

Severity:	Average Rut Depth over the segment.
Extent:	Assume full segment length.
Data Entry:	Single entry in 0.25 inch increments to right of description.
Comments:	Estimate mean rut depth in inches. Use sags and humps for localized rutting.

4. Longitudinal Cracking - Joint Reflective and Construction Joint - Same as #3

The name of the distress is different

7. Flushing or Bleeding

Severity:	Low	Minor amount of aggregate is covered
	Medium	Significant amount of aggregate is covered
	High	Most of the aggregate is covered
Extent:		Enter the area of distress in square feet
Comments:	Rate raveling and flushing separately.	

8. Patching – Maintenance -

Severity:	Low	Good condition.
	Medium	Moderately deteriorated – ride medium.
	High	Badly deteriorated – ride poor.
Extent:		Entry the area in square feet for each severity.
Comments:	Utility patching is rated separately.	

9. Patching – Utility: Rated the same as #8, maintenance patching:

For both maintenance and utility patching in the Centerline user's manual, the patch is rated by the methods shown in 8 and 9. In addition, any distresses which occur within or on the edge of the patch, (alligator, raveling, etc) are included in the total quantity of that distress in the sample unit.

12. Block Cracking

Extent: Enter the area in sq. feet for each severity.

13. Edge Condition

Extent: Enter the accumlated lengths for each severity. N/A
Comment: Rate both sides of the street.

14. Crack Seal Condition

Severity: Low Crack sealant is in good condition.

	Medium	Crack sealant is open and allows water into crack.
	High	Crack sealant is missing or non-existent.
Extent:	Percent of total cracks that are sealed. Enter percentage for each severity.	
Comments:	Example: 50L, 25M = 50% are sealed & in low condition plus 25% in medium condition. 25% are not sealed.	

B. Modifications employed by the City of Vancouver

2. Fatigue (Alligator) Cracking

Minor areas of alligator cracking (1-6 square feet) are simply tabulated in a count. The total square footage of these minor areas is calculated by multiplying the number of areas by 3 square feet and adding to the other alligator cracking in the sample.

6. Raveling

Predominant severity is estimated and recorded as well as an estimate of the percentage of total surface area in the sample which is raveled

8. Patching – Maintenance -

The joint around the patch is included as nonwheel path longitudinal cracking and transverse cracking. The patch itself is rated as shown in the manual.

Comments: Utility patching is rated separately.

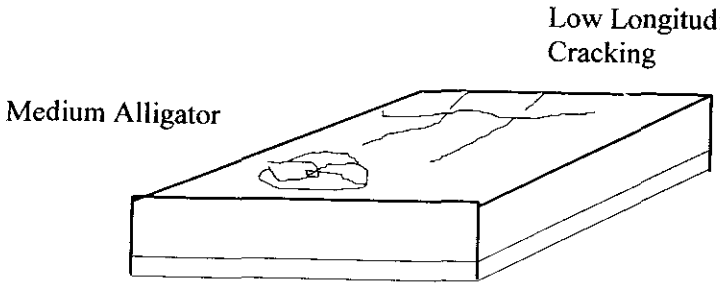
9. Patching – Utility: Rated the same as #8, maintenance patching:

Distresses 1, (Rutting and Wear), 7 (Flushing and Bleeding), 10 (Corrugations and Waves), 11 (Sags and Humps), 12 (Block Cracking) and 13 (Pavement Edge Condition) are not rated in the survey. This decision was made because many of the distresses rarely occurred and we wanted to limit the number of items the reviewers were looking at. Rutting and Wear are very difficult to measure and we felt there was a safety issue with our raters, consequently, the rutting is not rated however, severely rutted pavements are known and this is factored into our decision on M&R timing.

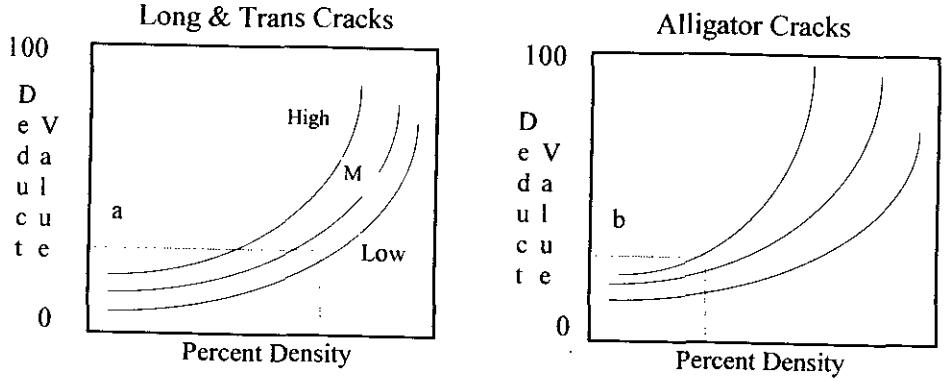
Index Score Calculations

The PAVER/ASTM deduct curves are used with this procedure for computing the resulting score. The following flowchart shows the general process of calculating the score. The table shows the PAVER/ASTM curves used in calculating deducts for each of the distress types in the current manual. The curves and procedure for calculating the corrected deduct value is also given.

Step 1 - Inspect sample units: Determine distress types and severity levels and measure density.

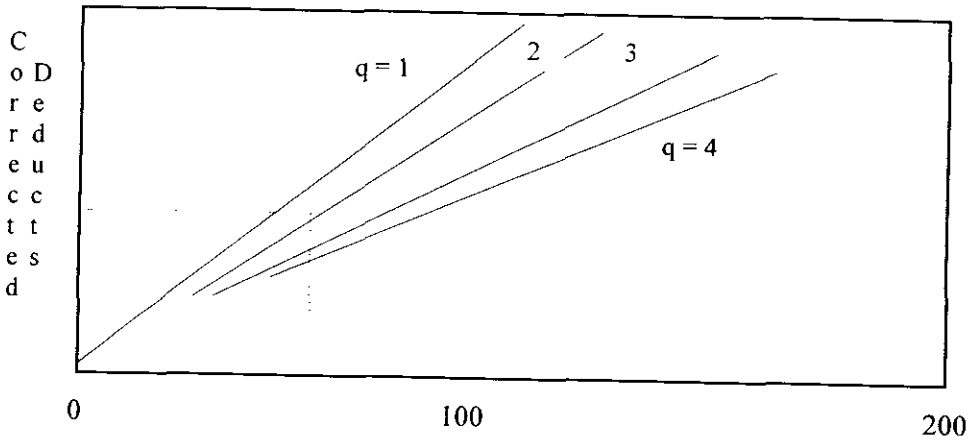


Step 2. - Determine deduct values.



Step 3. Compute total deduct value (TDV) = a+b

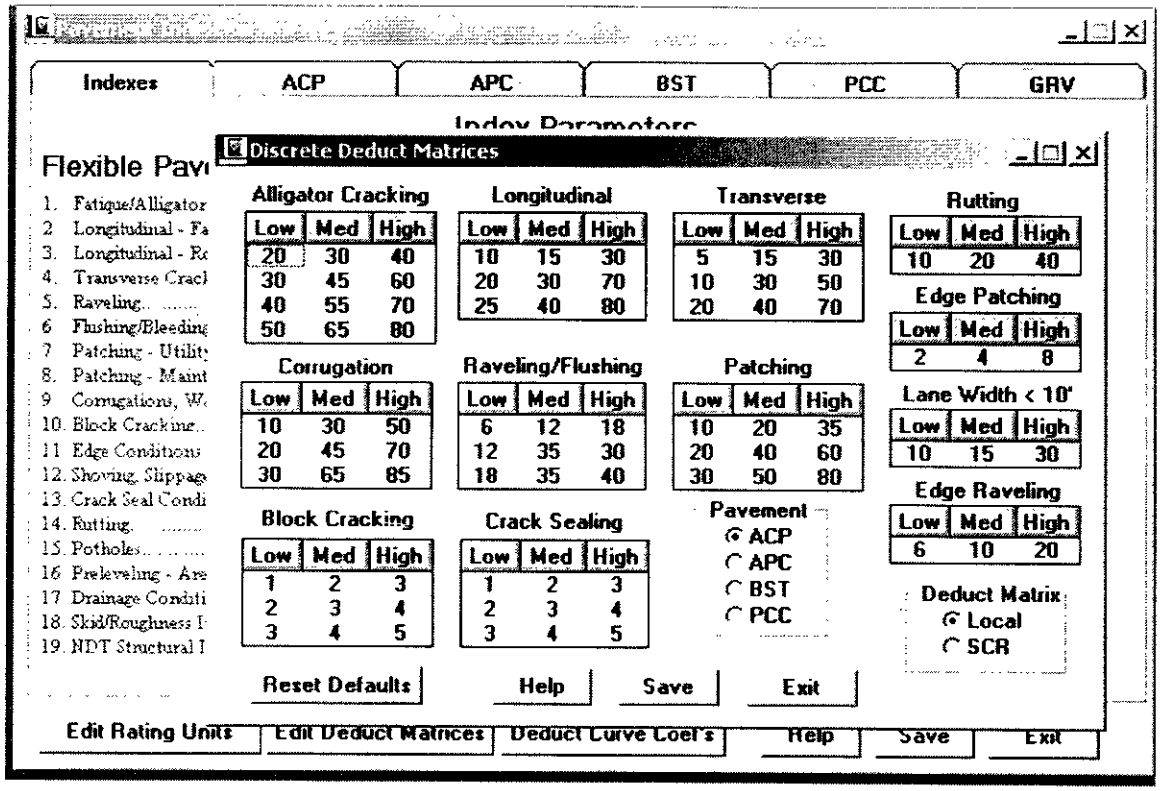
Step 4. Adjust total deduct value.

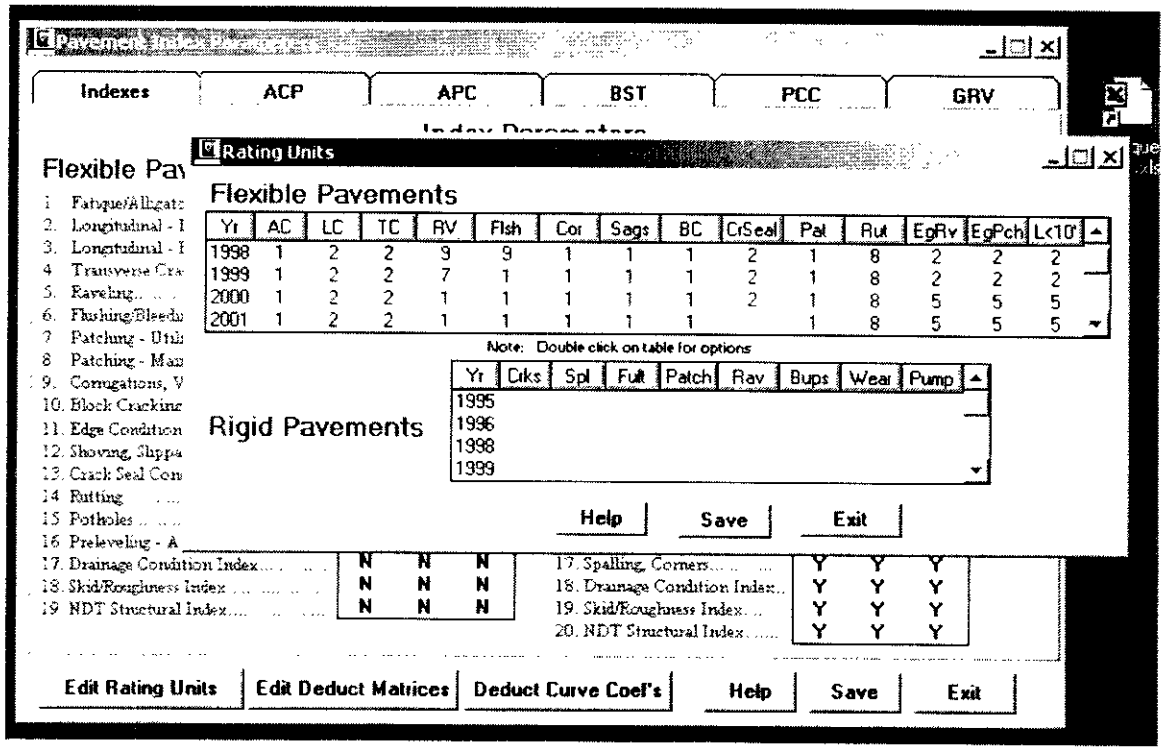


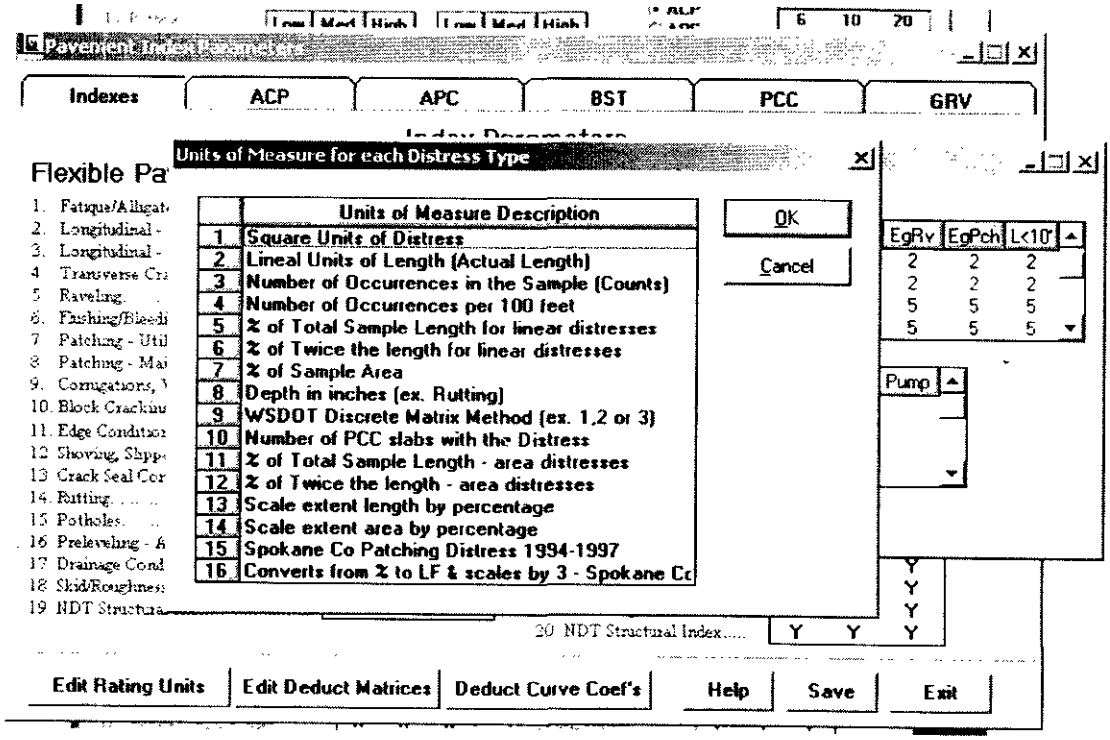
Step 5. Compute pavement condition index PCI/CDI = 100 - CDV for each for each inspected

WSEXT - DEDUCT CURVE SUMMARY – Flexible Pavements

WSEXT		PAVER/ASTM	
#	Distress Type	#	Curve Used
1	Rutting	15	Rutting
2	Fatigue Cracking	1	Alligator Cracking
3	Longitudinal-Fatigue Cracks	1	Alligator Low for all severities
4	Longitudinal-Reflective Cracks	10	Transverse & Longitudinal
5	Transverse Cracking	10	Transverse & Longitudinal
6	Raveling	19	WSDOT Method, User Defined Deduct matrix
7	Flushing	2	WSDOT Method, User Defined Deduct matrix
8	Patching -Maintenance	11	Patch & Utility Cuts
9	Patching - Utility	11	Not used in score calculations
10	Corrugations & Waves	5	Corrugation
11	Sags & Humps	4	Bumps and Sags
12	Block Cracking	3	Block Cracking
13a	Edge Raveling	7	Edge Cracking Medium
13b	Edge Patching	7	Edge Cracking Low
13c	Edge Lane < 10'	7	Edge Cracking High
14	Crack Seal Condition		Inventory only


Indexes
ACP
APC
BST
PCC
GRV
Discrete Deduct Matrices
Alligator Cracking
Low Med High
20 30 40
30 45 60
40 55 70
50 65 80
Longitudinal
Low Med High
10 15 30
20 30 70
25 40 80
Transverse
Low Med High
5 15 30
10 30 50
20 40 70
Rutting
Low Med High
10 20 40
Edge Patching
Low Med High
2 4 8
Corrugation
Low Med High
10 30 50
20 45 70
30 65 85
Raveling/Flushing
Low Med High
6 12 18
12 35 30
18 35 40
Patching
Low Med High
10 20 35
20 40 60
30 50 80
Lane Width < 10'
Low Med High
10 15 30
Edge Raveling
Low Med High
6 10 20
Block Cracking
Low Med High
1 2 3
2 3 4
3 4 5
Crack Sealing
Low Med High
1 2 3
2 3 4
3 4 5
Pavement
ACP
APC
BST
PCC
Deduct Matrix
Local
SCR
Reset Defaults
Help
Save
Exit
Edit Rating Units
Edit Deduct Matrices
Deduct Curve Coef's
Help
Save
Exit


Indexes
ACP
APC
BST
PCC
GRV
Rating Units
Flexible Pavements
Yr AC LC TC RV Fish Cor Sags BC CrSeal Pat Rut EgRv EgPch L<10'
1998 1 2 2 9 9 1 1 1 2 1 8 2 2 2
1999 1 2 2 7 1 1 1 1 2 1 8 2 2 2
2000 1 2 2 1 1 1 1 1 2 1 8 5 5 5
2001 1 2 2 1 1 1 1 1 1 8 5 5 5
Note: Double click on table for options
Rigid Pavements
Yr Crks Spl Fult Patch Rav Bups Wear Pump
1995
1996
1998
1999
Help
Save
Exit
17. Drainage Condition Index N N N
18. Skid/Roughness Index N N N
19. NDT Structural Index N N N
17. Spalling, Corners Y Y Y
18. Drainage Condition Index Y Y Y
19. Skid/Roughness Index Y Y Y
20. NDT Structural Index Y Y Y
Edit Rating Units
Edit Deduct Matrices
Deduct Curve Coef's
Help
Save
Exit


Indexes
ACP
APC
BST
PCC
GRV
Units of Measure for each Distress Type
Units of Measure Description
1 Square Units of Distress
2 Lineal Units of Length (Actual Length)
3 Number of Occurrences in the Sample (Counts)
4 Number of Occurrences per 100 feet
5 % of Total Sample Length for linear distresses
6 % of Twice the length for linear distresses
7 % of Sample Area
8 Depth in inches (ex. Rutting)
9 WSDOT Discrete Matrix Method (ex. 1,2 or 3)
10 Number of PCC slabs with the Distress
11 % of Total Sample Length - area distresses
12 % of Twice the length - area distresses
13 Scale extent length by percentage
14 Scale extent area by percentage
15 Spokane Co Patching Distress 1994-1997
16 Converts from % to LF & scales by 3 - Spokane Co
OK
Cancel
EgRv EgPch L<10'
Pump
20 NDT Structural Index.....
Edit Rating Units
Edit Deduct Matrices
Deduct Curve Coef's
Help
Save
Exit

ASTM/PAVER Curves

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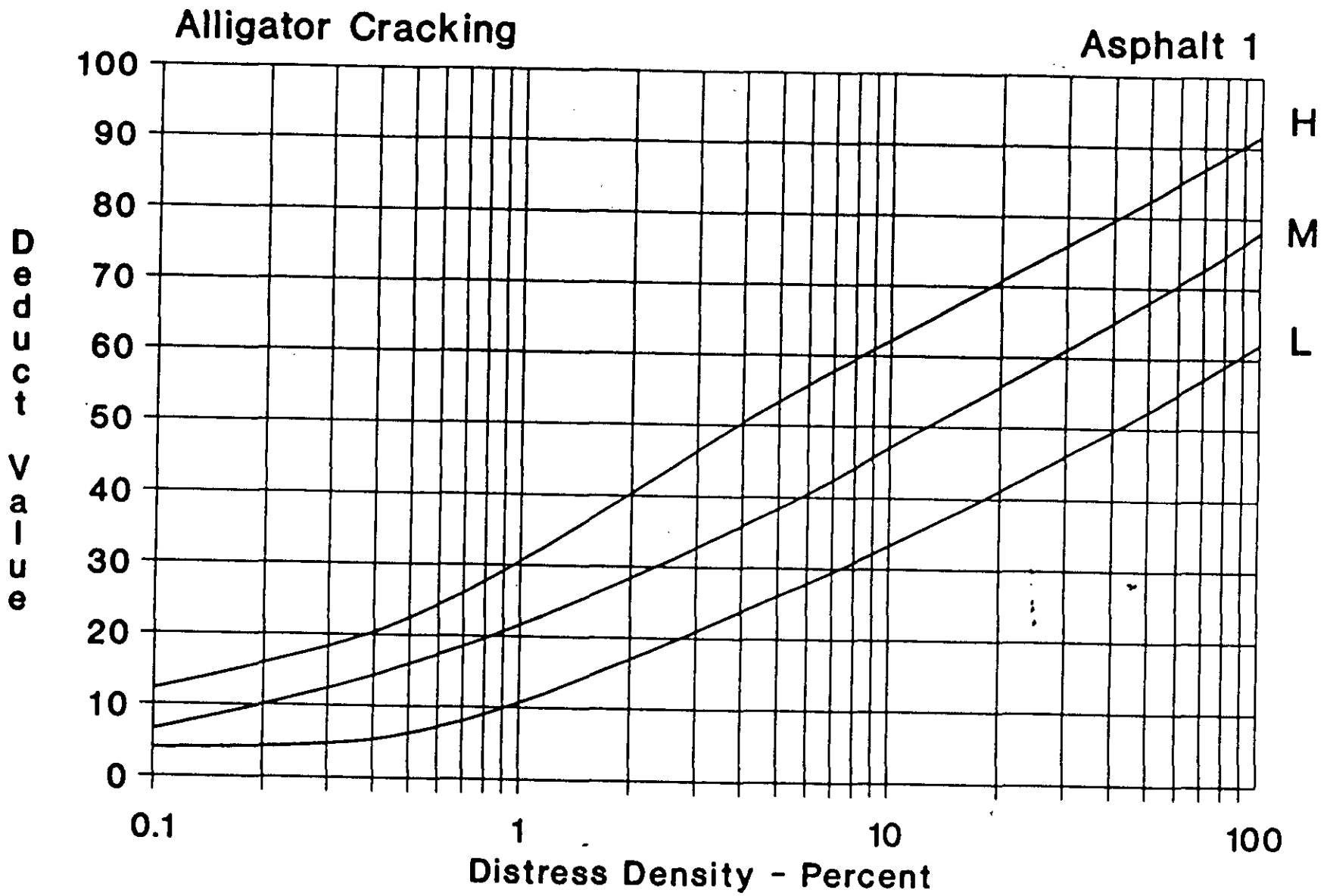
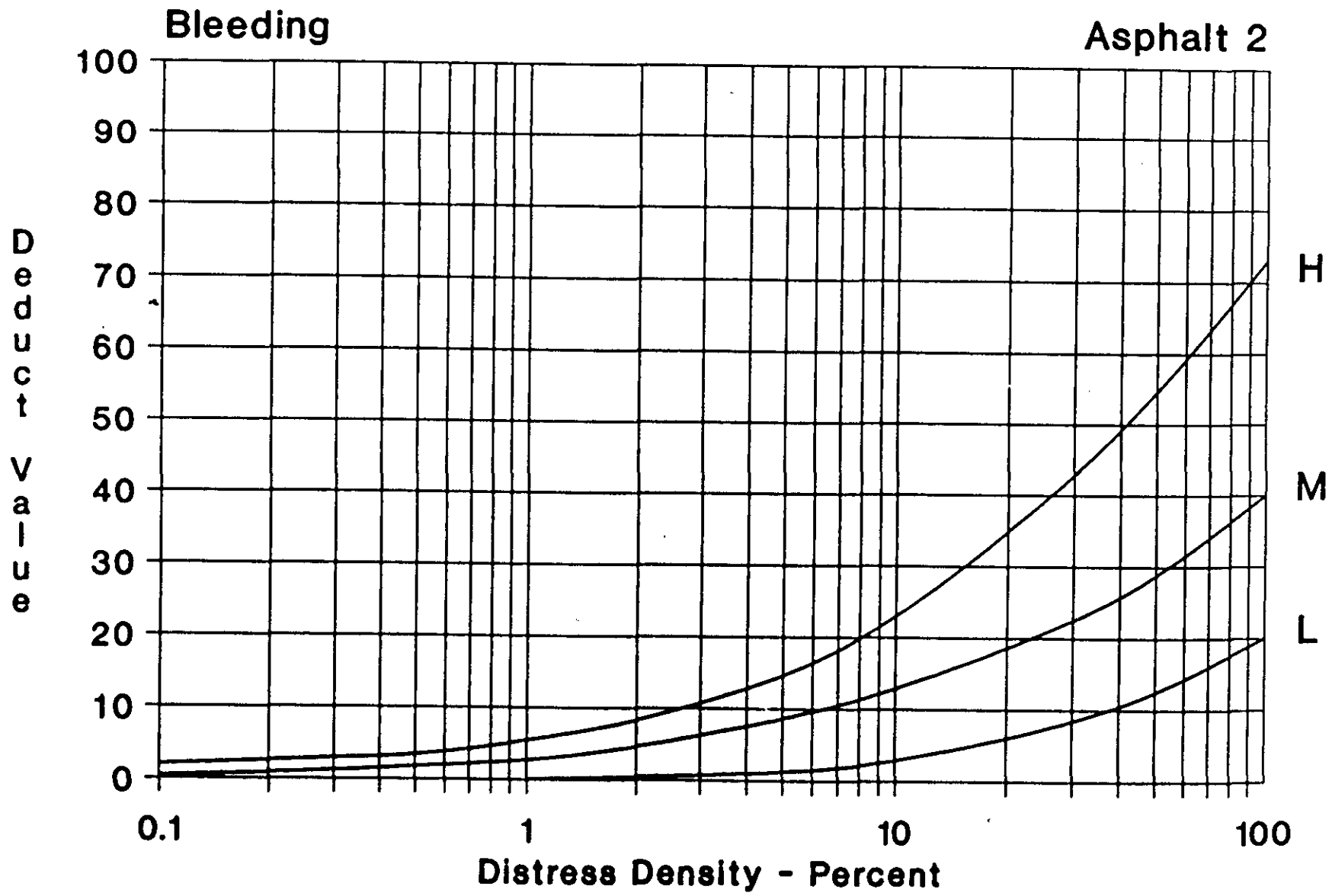
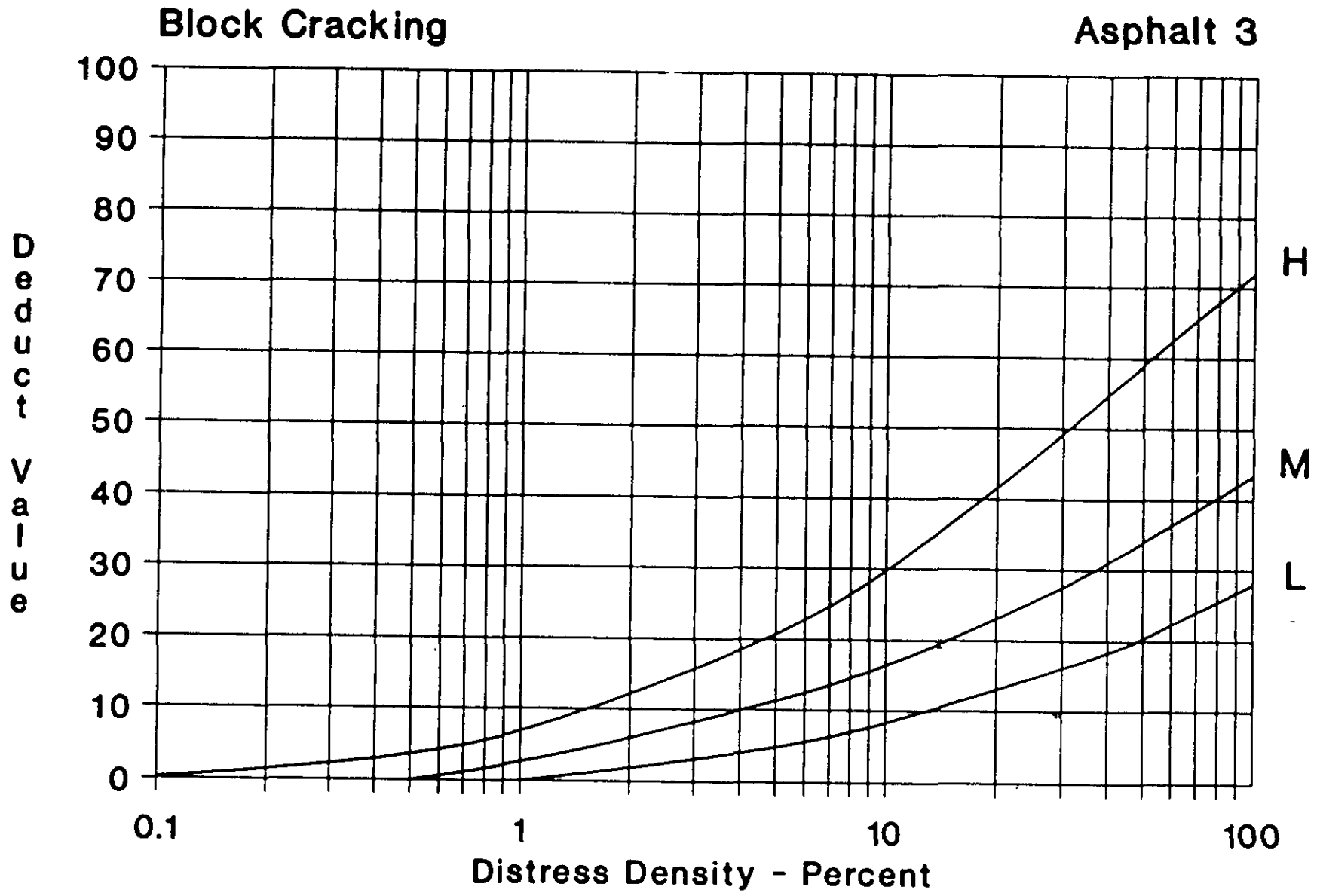
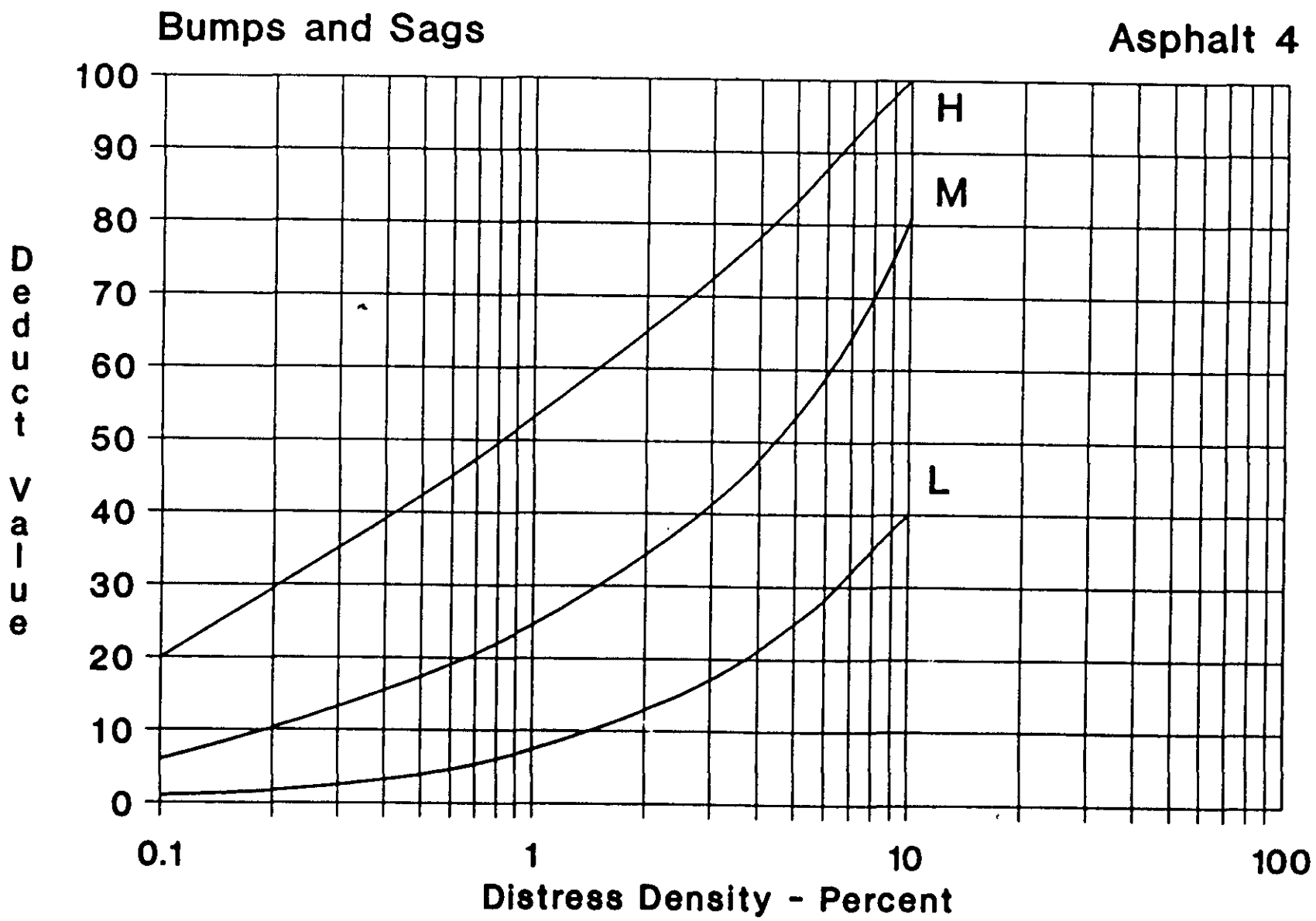
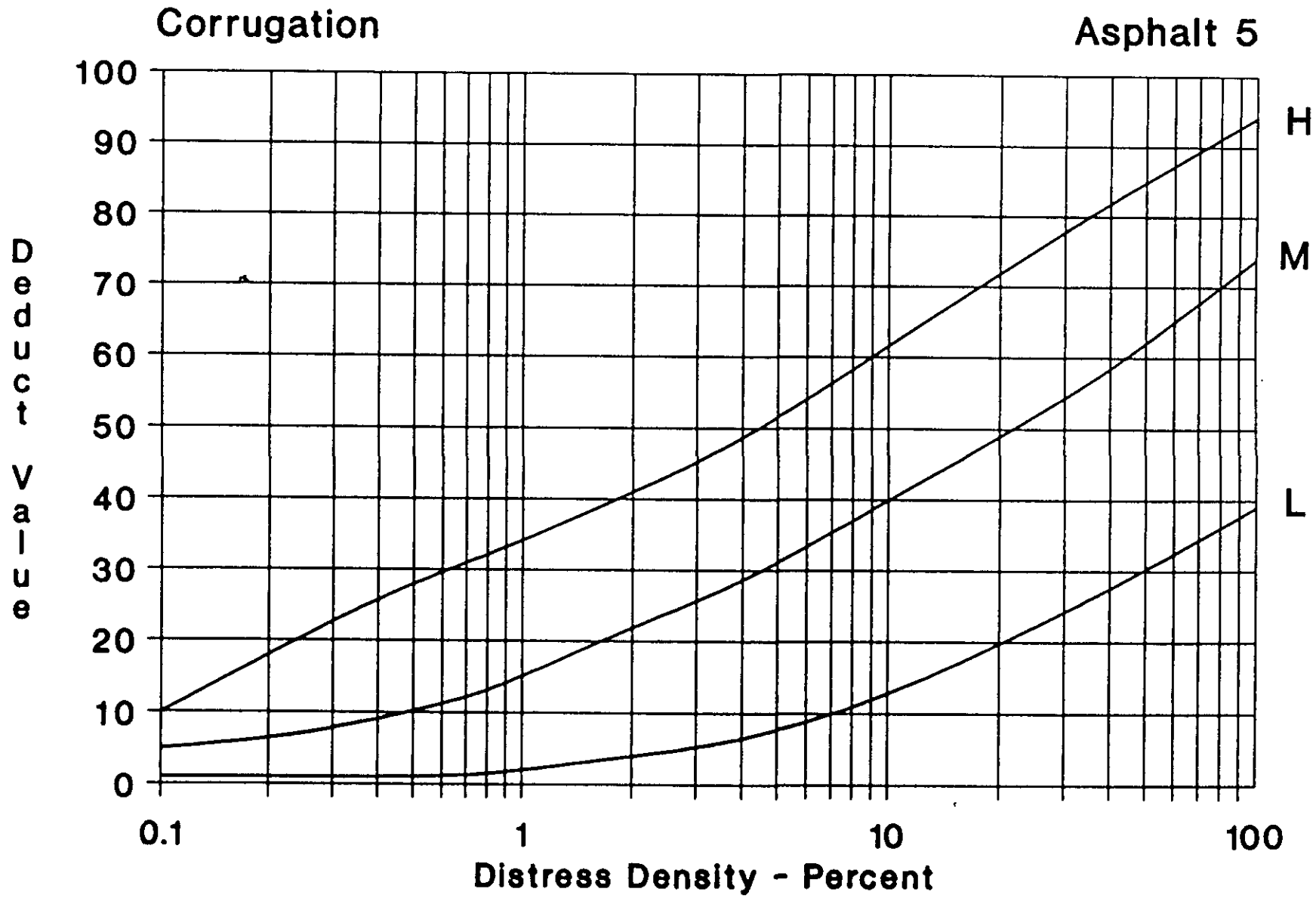
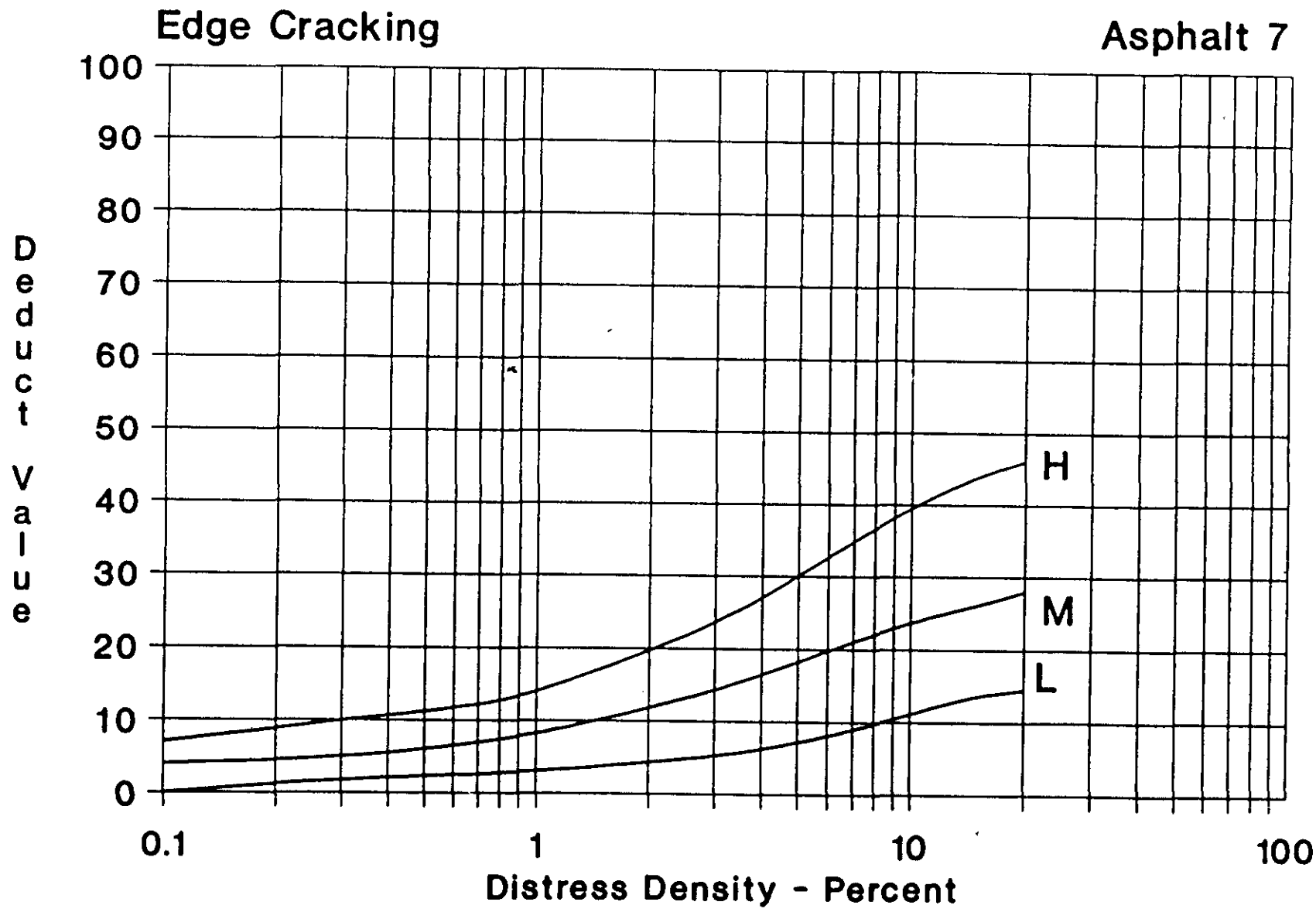

Alligator Cracking
Asphalt 1
100
90
80
70
60
50
40
30
20
10
0
Deduct Value
H
M
L
0.1
1
10
100
Distress Density - Percent

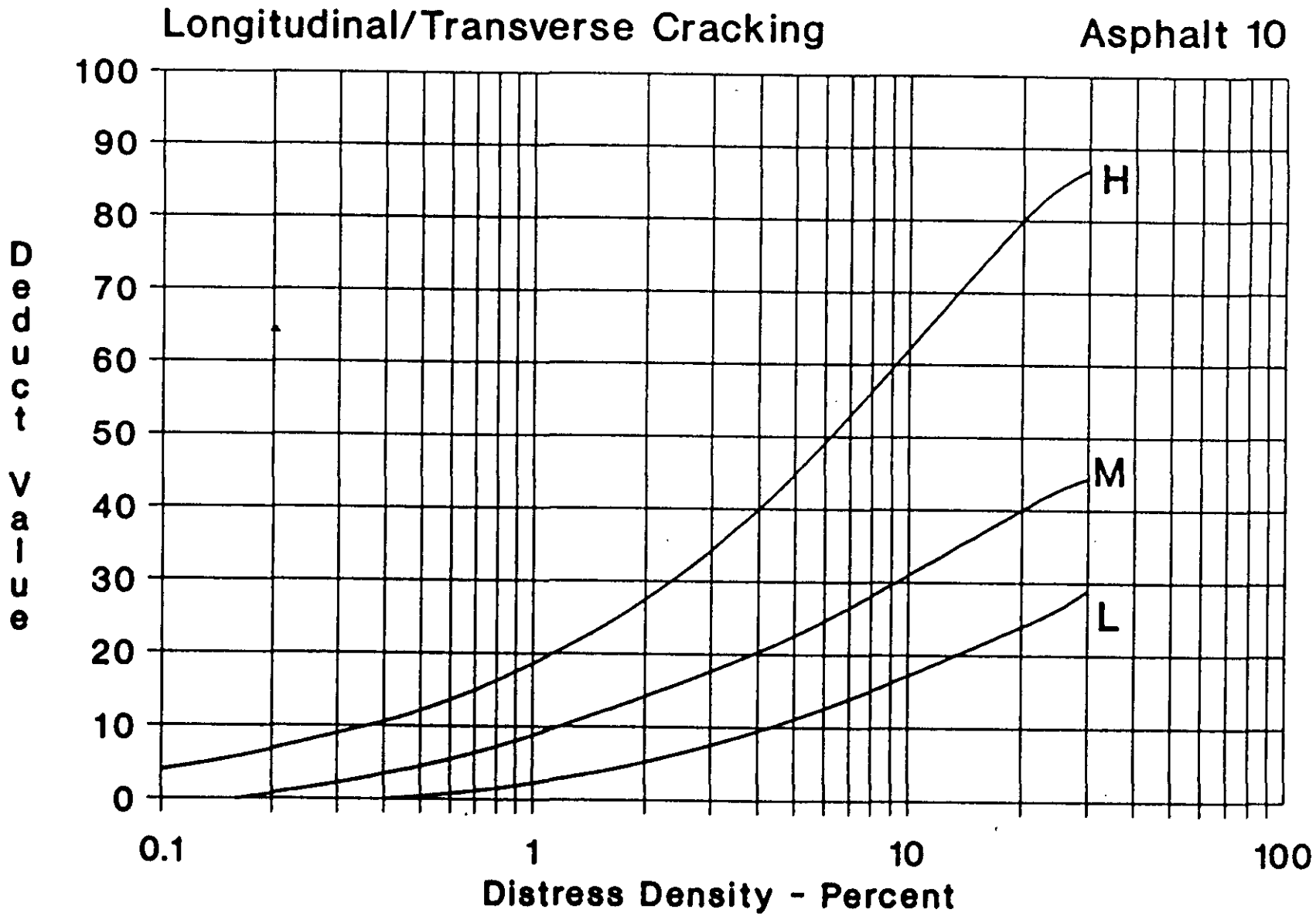

Bleeding
Asphalt 2
100
90
80
70
60
50
40
30
20
10
0
Deduct Value
H
M
L
0.1
1
10
100
Distress Density - Percent

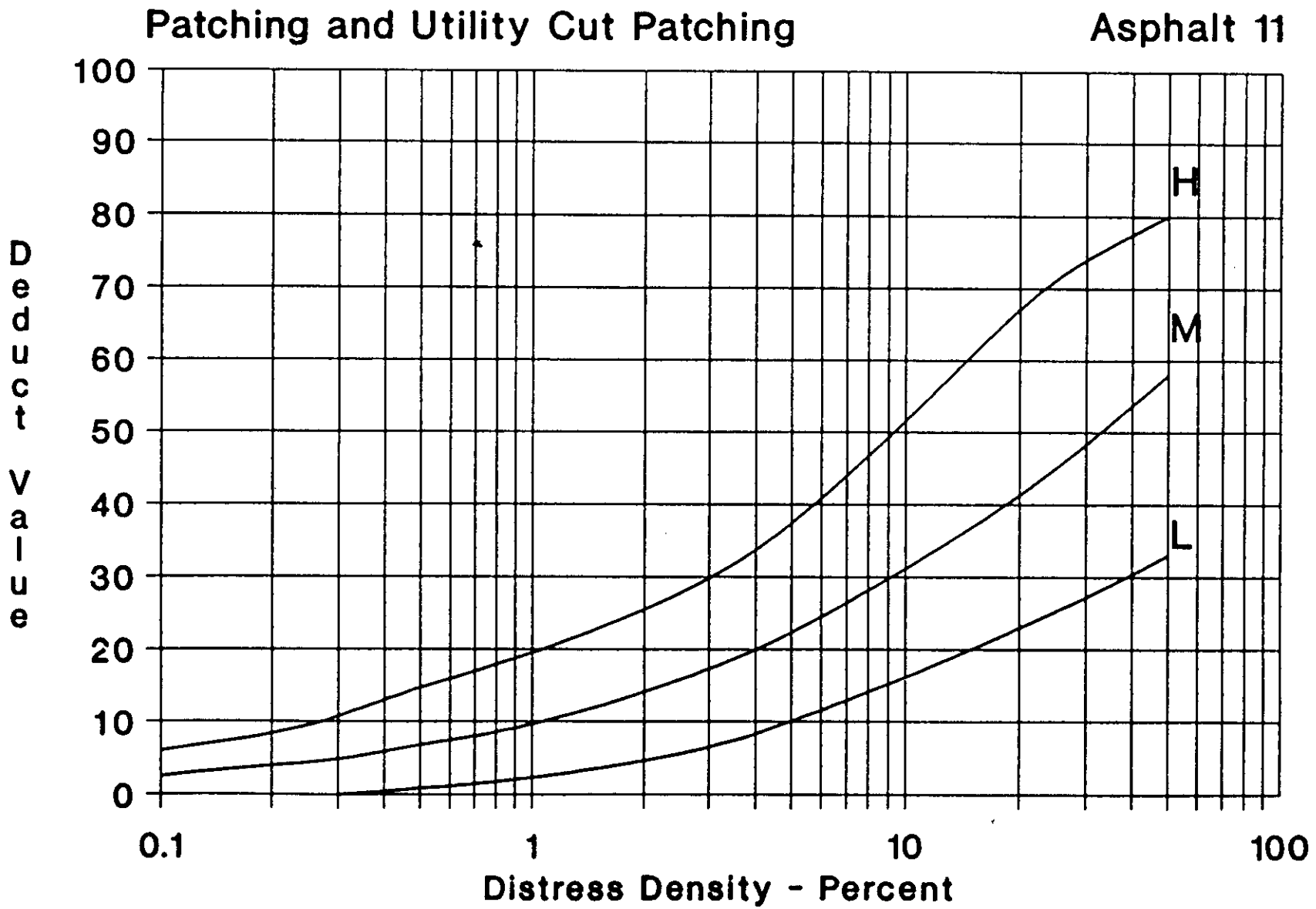

Block Cracking
Asphalt 3
100
90
80
70
60
50
40
30
20
10
0
Deduct Value
H
M
L
0.1
1
10
100
Distress Density - Percent

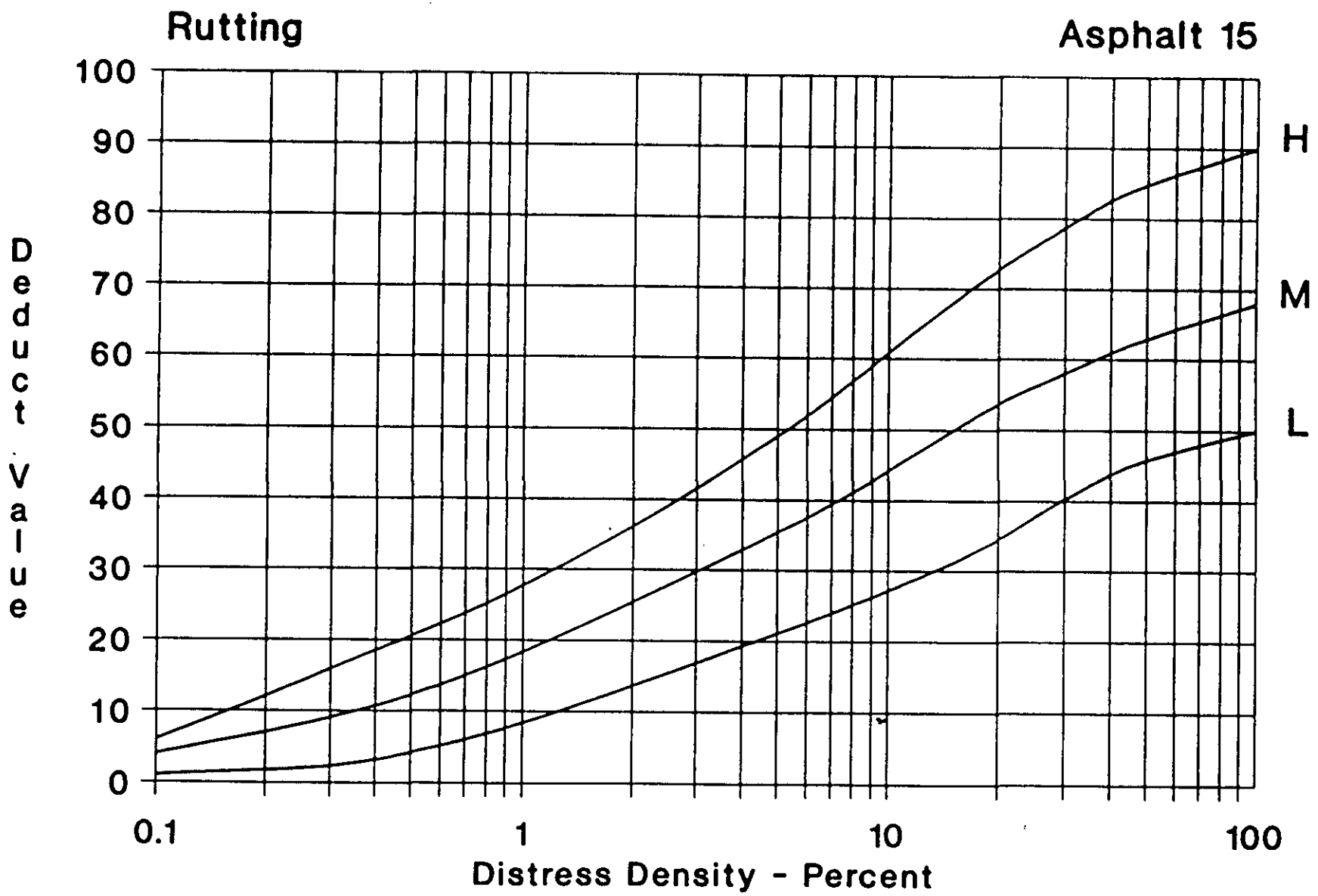

Bumps and Sags
Asphalt 4
100
90
80
70
60
50
40
30
20
10
0
Deduct Value
H
M
L
0.1
1
10
100
Distress Density - Percent

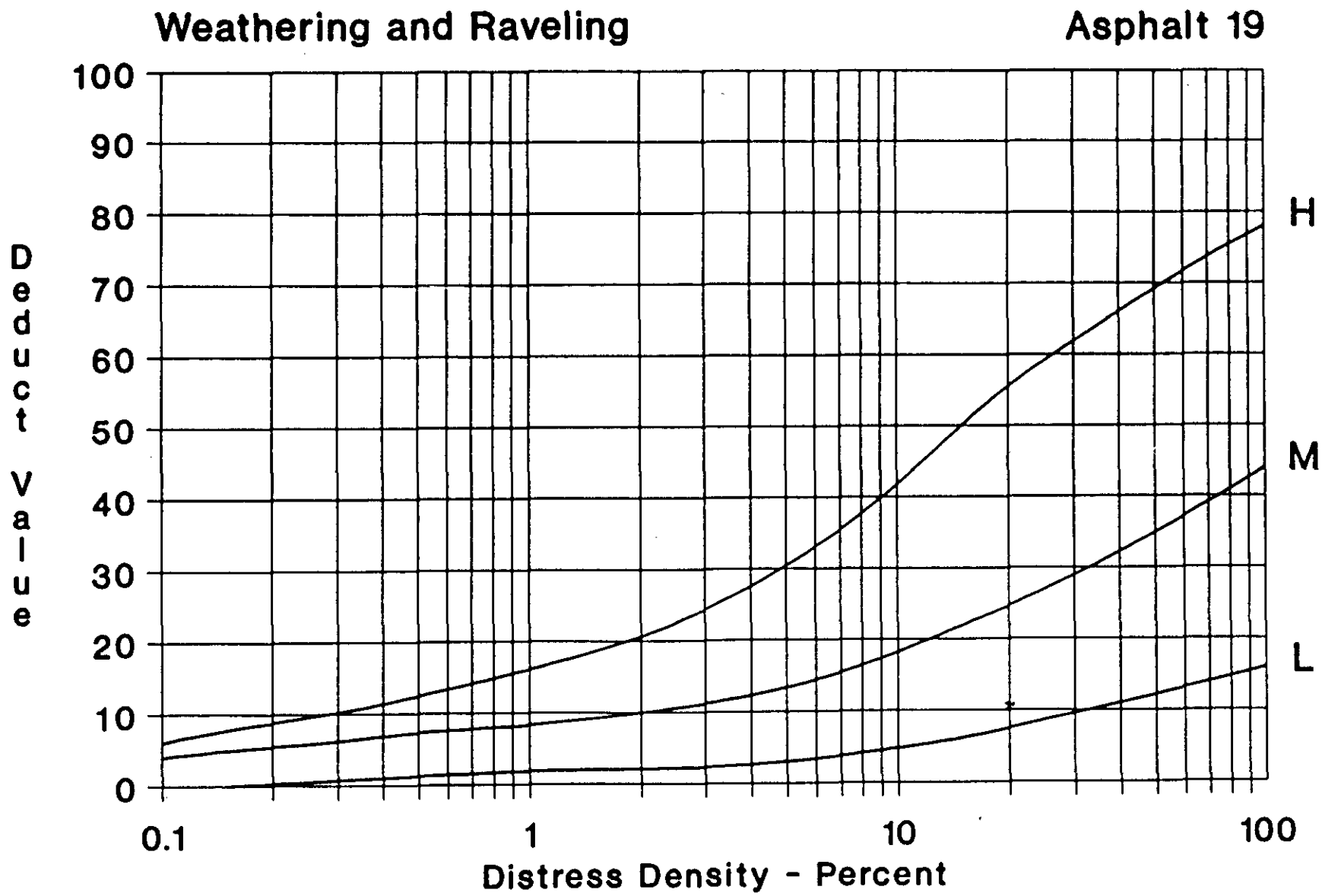

Corrugation
Asphalt 5
100
90
80
70
60
50
40
30
20
10
0
Deduct Value
H
M
L
0.1
1
10
100
Distress Density - Percent


Edge Cracking
Asphalt 7
100
90
80
70
60
50
40
30
20
10
0
Deduct Value
H
M
L
0.1
1
10
100
Distress Density - Percent


Longitudinal/Transverse Cracking
Asphalt 10
Deduct Value
100
90
80
70
60
50
40
30
20
10
0
H
M
L
0.1
1
10
100
Distress Density - Percent


Patching and Utility Cut Patching
Asphalt 11
100
90
80
70
60
50
40
30
20
10
0
Deduct Value
H
M
L
0.1
1
10
100
Distress Density - Percent


Rutting
Asphalt 15
100
90
80
70
60
50
40
30
20
10
0
Deduct Value
H
M
L
0.1
1
10
100
Distress Density - Percent


Weathering and Raveling
Asphalt 19
100
90
80
70
60
50
40
30
20
10
0
Deduct Value
H
M
L
0.1
1
10
100
Distress Density - Percent

Method for Calculating the Corrected Deduct Value for Multiple Distresses

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n = number of sample units to be inspected.

The first sample unit to be inspected is selected at random from sample units 1 through i. The sample units within a section that are successive increments of the interval i after the first randomly selected unit also are inspected.

7.6 A lessor sampling rate than the above mentioned 95 % confidence level can be used based on the condition survey objective. As an example, one agency uses the following table for selecting the number of sample units to be inspected for other than project analysis:

Given	Survey
1 to 5 sample units	1 sample unit
6 to 10 sample units	2 sample units
11 to 15 sample units	3 sample units
16 to 40 sample units	4 sample units
over 40 sample units	10 %

7.7 Additional sample units only are to be inspected when nonrepresentative distresses are observed as defined in 2.1.1. These sample units are selected by the user.

8. Inspection Procedure

8.1 The definitions and guidelines for quantifying distresses for PCI determination are given in Appendix X1 for AC pavements. Using this test method, inspectors should identify distress types accurately 95 % of the time. Linear measurements should be considered accurate when they are within 10 % if remeasured, and area measurements should be considered accurate when they are within 20 % if remeasured. Distress severities that one determines based on ride quality are considered subjective.

8.2 *Asphalt Concrete (AC) Surfaced Pavement*—Individually inspect each sample unit chosen. Sketch the sample unit, including orientation. Record the branch and section number and the number and type of the sample unit (random or additional). Record the sample unit size measured with the hand odometer. Conduct the distress inspection by walking over the sidewalk/shoulder of the sample unit being surveyed, measuring the quantity of each severity level of every distress type present, and recording the data. Each distress must correspond in type and severity to that described in Appendix X1. The method of measurement is included with each distress description. Repeat this procedure for each sample unit to be inspected. A copy of a Blank Flexible Pavement Condition Survey Data Sheet for Sample Unit is included in Fig. 2.

8.3 *PCC Pavements*—Individually inspect each sample unit chosen. Sketch the sample unit showing the location of the slabs. Record the sample unit size, branch and section number, and number and type of the sample unit (random or additional), the number of slabs in the sample unit and the slab size measured with the hand odometer. Perform the inspection by walking over the sidewalk/shoulder of the sample unit being surveyed and recording all distress existing in the slab along with their severity level. Each distress type and severity must correspond with that described in Appendix X2. Summarize the distress types, their severity levels and the number of slabs in the sample unit containing each type and severity level. Repeat this procedure for each sample unit to be inspected. A copy of a Blank Jointed Rigid Pavement Condition Survey Data Sheet for Sample Unit is included in Fig. 3.

9. Calculation of PCI for Asphalt Concrete (AC) Pavement

9.1 Add up the total quantity of each distress type at each severity level, and record them in the "Total Severities" section. For example, Fig. 4 shows five entries for the Distress Type 1, "Alligator Cracking": 5L, 4L, 4L, 8H, and 6H. The distress at each severity level is summed and entered in the "Total Severity" section as 13 ft^2 (1.2 m^2) of low severity and 14 ft^2 (1.3 m^2) of medium severity. The units for the quantities may be either in square feet (square meters), linear feet (meters), or number of occurrences, depending on the distress type.

9.2 Divide the total quantity of each distress type at each severity level from 9.1 by the total area of the sample unit and multiply by 100 to obtain the percent density of each distress type and severity.

9.3 Determine the deduct value (DV) for each distress type and severity level combination from the distress deduct value curves in Appendix X3.

9.4 Determine the maximum corrected deduct value (CDV). The procedure for determining maximum CDV from individual DVs is identical for both AC and PCC pavement types.

9.5 The following procedure must be used to determine the maximum CDV.

9.5.1 If none or only one individual deduct value is greater than two, the total value is used in place of the maximum CDV in determining the PCI; otherwise, maximum CDV must be determined using the procedure described in 9.5.2-9.5.5.

9.5.2 List the individual deduct values in descending order. For example, in Fig. 4 this will be 25.1, 23.4, 17.9, 11.2, 7.9, 7.5, 6.9, and 5.3.

9.5.3 Determine the allowable number of deducts, m, from Fig. 5, or using the following formula (see Eq 4):

$$m = 1 + (9/98)(100\text{–}HDV) \leq 10 \quad (4)$$

where:

m = allowable number of deducts including fractions (must be less than or equal to ten), and

HDV = highest individual deduct value.

(For the example in Fig. 4, $m = 1 + (9/98)(100\text{-}25.1) = 7.9$).

9.5.4 The number of individual deduct values is reduced to the m largest deduct values, including the fractional part. For the example in Fig. 6, the values are 25.1, 23.4, 17.9, 11.2, 7.9, 7.5, 6.9, and 4.8 (the 4.8 is obtained by multiplying 5.3 by (7.9 – 7 = 0.9)). If less than m deduct values are available, all of the deduct values are used.

9.5.5 Determine maximum CDV iteratively, as shown in Fig. 6.

9.5.5.1 Determine total deduct value by summing individual deduct values. The total deduct value is obtained by adding the individual deduct values in 9.5.4, that is, 104.7.

9.5.5.2 Determine q as the number of deducts with a value greater than 2.0. For example, in Fig. 6, q=8.

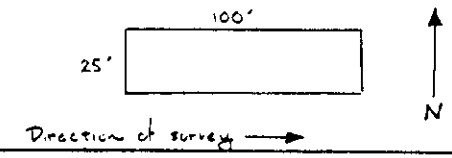
9.5.5.3 Determine the CDV from total deduct value and q by looking up the appropriate correction curve for AC pavements in Fig. X4.15 in Appendix X3.

9.5.5.4 Reduce the smallest individual deduct value greater

ASPHALT SURFACED ROADS AND PARKING LOTS
CONDITION SURVEY DATA SHEET
FOR SAMPLE UNIT

BRANCH SPRINGFIELD SECTION 001 SAMPLE UNIT 1
SURVEYED BY KAK DATE 10 JUL 93 SAMPLE AREA 2500 sf

SKETCH:



1. Alligator Cracking
2. Bleeding
3. Block Cracking
4. Bumps and Sags
5. Corrugation
6. Depression
7. Edge Cracking
8. Jt. Reflection Cracking
9. Lane/Shoulder Drop Off
10. Long & Trans Cracking
11. Patching & Util Cut Patching
12. Polished Aggregate
13. Potholes
14. Railroad Crossing
15. Rutting
16. Shoving
17. Slippage Cracking
18. Swell
19. Weathering/Raveling

DISTRESS SEVERITY	QUANTITY									TOTAL	DENSITY %	DEDUCT VALUE
1 L	1x5	1x4	1x4							13	0.52	7.9
1 H	1x8	1x6								14	0.56	23.4
7 L	32	15	18	24	41					130	5.20	7.5
8 M	20	15	35	27	23	10	13			143	5.72	25.1
11 H	3x4	2x5								22	0.88	17.9
13 L	1									1	0.04	11.2
15 L	4	9	8							21	0.84	6.9
19 L	250									250	10.0	5.3

FIG. 4 Example of a Flexible Pavement Condition Survey Data Sheet

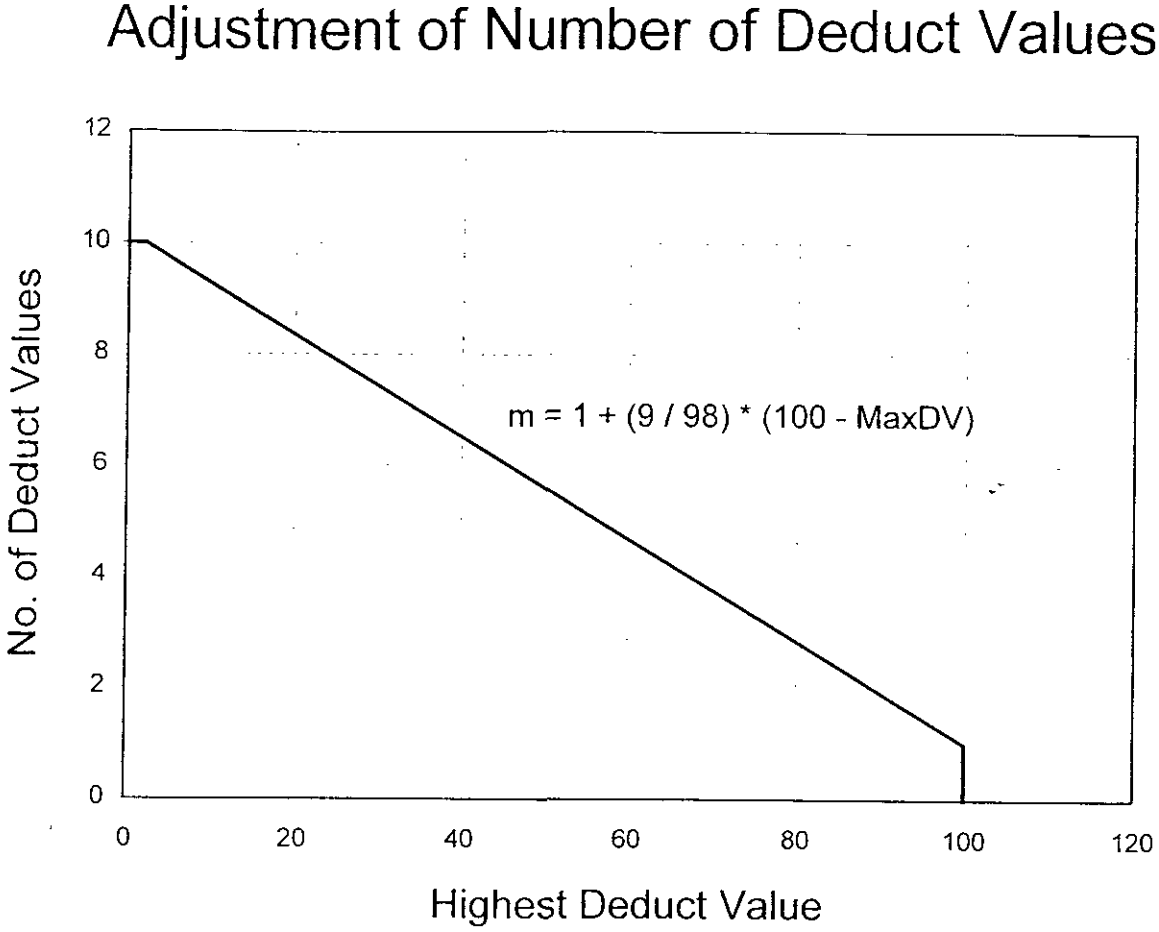


FIG. 5 Adjustment of Number of Deduct Values

than 2.0 to 2.0 and repeat 9.5.5.1-9.5.5.3 until $q = 1$.

9.5.5.5 Maximum CDV is the largest of the CDVs.

9.6 Calculate PCI by subtracting the maximum CDV from 100: PCI = 100-max CDV.

9.7 Fig. 6 shows a summary of PCI calculation for the example AC pavement data in Fig. 4. A blank PCI calculation form is included in Fig. 2.

10. Calculation of PCI for Portland Cement Concrete (PCC) Pavement

10.1 For each unique combination of distress type and severity level, add up the total number of slabs in which they occur. For the example in Fig. 7, there are two slabs containing low-severity corner break (Distress 22L).

10.2 Divide the number of slabs from 10.1 by the total number of slabs in the sample unit and multiply by 100 to obtain the percent density of each distress type and severity combination.

10.3 Determine the deduct values for each distress type severity level combination using the corresponding deduct curve in Appendix X4.

10.4 Determine PCI by following the procedures in 9.5 and 9.6, using the correction curve for PCC pavements (see Fig. X4.20 in Appendix X4) in place of the correction curve for AC pavements.

10.5 Fig. 7 shows a summary of PCI calculation for the example PCC pavement distress data in Fig. 8.

11. Determination of Section PCI

11.1 If all surveyed sample units are selected randomly or if every sample unit is surveyed then the PCI of the section is the average of the PCIs of the sample units. If additional sample units, as defined in 2.1.1, are surveyed then a weighted average is used as follows:

$$PCI_S = (N - A)(PCI_R)/N + A(PCI_A)/N \quad (5)$$

where:

PCI_S = weighted PCI of the section,
N = total number of sample units in the section,
A = number of additional sample units,
PCI_R = mean PCI of randomly selected sample units, and
PCI_A = mean PCI of additional selected sample units.

11.2 Determine the overall condition rating of the section by using the section PCI and the condition rating scale in Fig. 1.

12. Report

12.1 Develop a summary report for each section. The summary lists section location, size, total number of sample units, the sample units inspected, the PCIs obtained, the average PCI for the section, and the section condition rating.

$m = 1 + (9/98) (100 - 25.1) = 7.9 < 8$

Use highest 7 deducts and 0.9 of eighth deduct.

$0.9 \times 5.3 = 4.8$

#	Deduct Values										Total	q	CDV
1	25.1	23.4	17.9	11.2	7.9	7.5	6.9	(4.8)			104.7	8	51.0
2	25.1	23.4	17.9	11.2	7.9	7.5	6.9	2			101.9	7	50.0
3	25.1	23.4	17.9	11.2	7.9	7.5	2	2			96.0	6	46.0
4	25.1	23.4	17.9	11.2	7.9	2	2	2			90.5	5	47.0
5	25.1	23.4	17.9	11.2	2	2	2	2			84.6	4	48.0
6	25.1	23.4	17.9	2	2	2	2	2			75.4	3	48.0
7	25.1	23.4	2	2	2	2	2	2			59.5	2	44.0
8	25.1	2	2	2	2	2	2	2			38.1	1	38.0
9													
10													

Max CDV = 51

PCI = 100 - Max CDV = 49

Rating = FAIR

FIG. 6 Calculation of Corrected PCI Value—Flexible Pavement

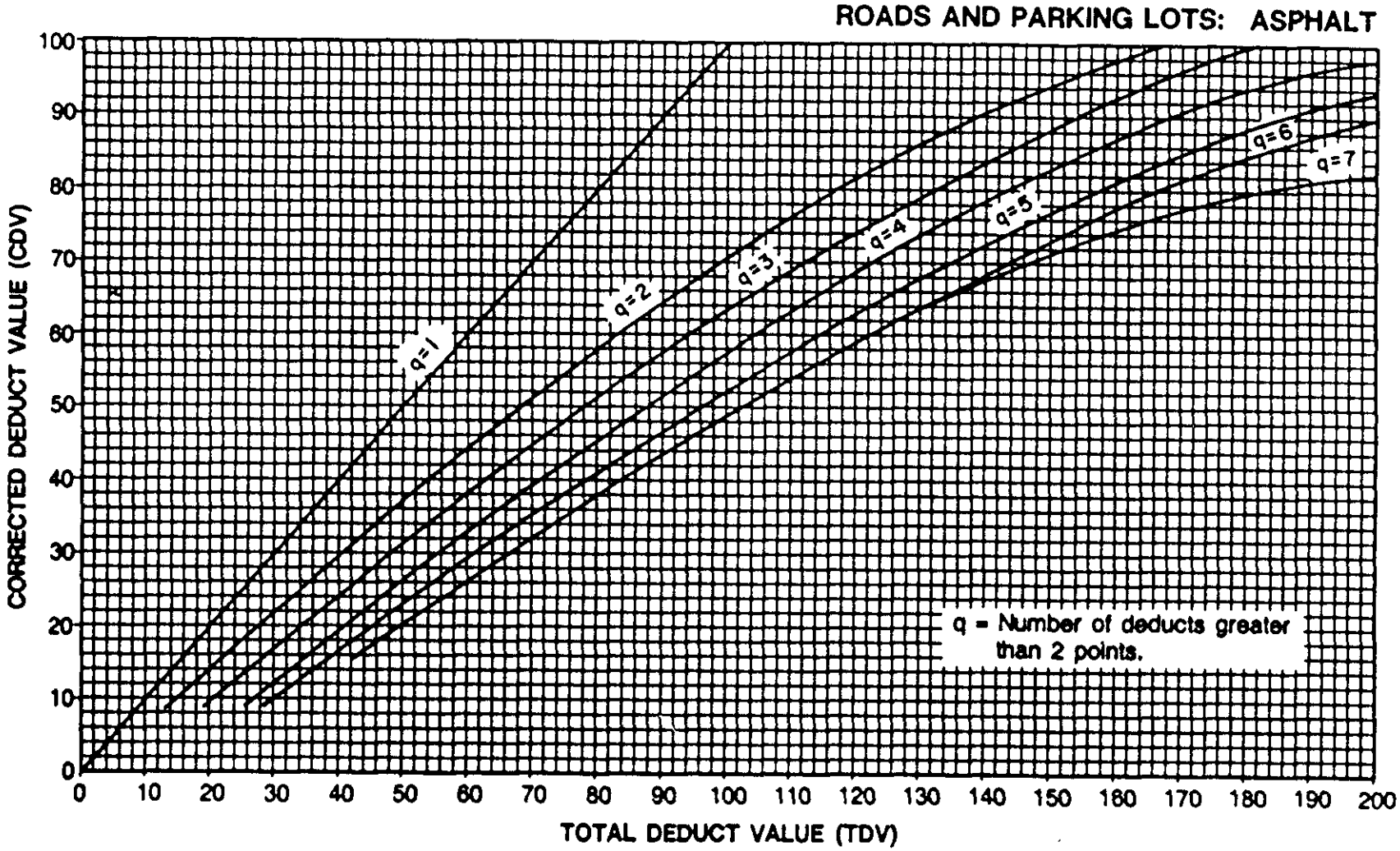

ROADS AND PARKING LOTS: ASPHALT
CORRECTED DEDUCT VALUE (CDV)
TOTAL DEDUCT VALUE (TDV)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
q=1
q=2
q=3
q=4
q=5
q=6
q=7
q = Number of deducts greater than 2 points.

Figure B-45.

Spokane County Rating Procedures

Spokane Counties rating procedures follow the Pavement Surface Condition Rating Manual. The only deviation from this standard of rating comes from the actual square footage rating of alligator and patching.

Alligator: **Alligator cracking is rated across the full lane width, predominant severity is recorded in square footage of occurrence. Potholes are recorded as high alligator for the affected area.**

1994-1997: Rated in linear feet, calculated as follows;
((length of alligator-linear ft./ (length of segment*2))*100
Entered into system as a percentage.

1998-1999: Rated in square feet, calculated as follows:
(length * width) = square feet of distress
Entered into system as square footage of distress

Longitudinal: **Measure the total length of all cracking that occurs in traveled lane. The predominant severity is recorded in linear feet. Cracks on the centerline of the road, and cracks not within 6" of the fog line, or acp edge, are counted.**

1994-1997 : Rated in linear feet calculated as follows:
((length of longitudinal cracking in linear ft./length of segment)*100)
Entered into system as a percentage

1998-1999: Rated in linear feet calculated as follows:
(length) = length of distress
Entered into system as linear feet of distress

Transverse: **Actual Counts of transverse cracks existing in the rated lane for the entire segment. The predominant severity is recorded. Transverse cracks are counted if they extend across one wheel path, and are a minimum of 2 feet in length.**

1994-1997: Rated in counts per 100 feet calculated as follows:
((# Of transverse cracks per segment/5)***(assumes rating segment of 500')
Entered into system as cracks per 100 feet

1998-1999: Rated in actual counts per segment.
Entered into system as counts per segment.

Patching: **All patches are rated, maintenance and utility. The determination of the severity level does not correspond to the Rating Manual. The severity level of the patch is actually determined by the condition of the patch rated, not by the type of patch. Patches are recorded in square feet of occurrence.**

1994-1997: Rated in linear feet, calculated as follows;
((length of patch-linear ft./ (length of segment*2))*100
Entered into system as a percentage.

1998-1999: Rated in square feet, calculated as follows:
(length * width) = square feet of distress
Entered into system as square footage of distress

Edge Condition: **Measure the predominant severity of distress in linear feet. Severity levels correspond to Standard Rating Procedures.**

1994-1997: Rated in linear feet, calculated as follows; ((length of edge condition in linear feet/ length of segment)*100 Entered into system as a percentage.

1998-1999: Rated in linear feet, calculated as follows: length of edge condition in linear feet = length of edge condition in linear feet. Entered into system as linear feet.

Rutting: **Record the predominant severity that best represents existing roadway condition. Extent is considered to be the full length of the segment.**

1994-1997: Rated as a 1-2 or 3, for predominant severity.

1998-1999: Rated as a .25", 50" or .75", for predominant severity.

Raveling/Flushing: **Record the predominant severity for the distress, Identify the extent as localized, wheel path, or entire lane. The extent is considered to be the length of the rated segment.**

1994-1997: Rated in length of the distress. Entered into system as linear feet of distress.

1998-1999: Rated as a 1-2 or 3, for predominant severity.

Pierce County Pavement Rating Method

January 4, 2002

A Summary of the data collection and distress quantity method performed in Pierce County.

HISTORY OF PAVEMENT RATING

Pierce County uses the accepted NWPMA's method for identifying and collecting distress quantities on the Counties Road System. These methods have been modified slightly to conform to the needs of the Counties Maintenance and Repair Program.

Pierce County has been conducting pavement ratings since 1992. Since that time the method of data collection has not changed. In 1992, we tried to determine the worst lane. Rating crews often changed their rating sample to what they thought was the worst lane in the middle of rating a segment. This approach proved to be a waste of field time. In addition, it was determined through analysis of the rating data that those ratings produced inconsistent results. In 1994 it was decided that in order to have some measure of consistency of ratings over time we should rate the same lane in a predetermined direction for the life of that road.

Listed below is description of the different defect categories that are in use for Pierce Counties annual rating Program. These methods are unique to Pierce County and should not be applied to any other agencies road system without considering the effects that these methods might have on the overall rating.

PAVEMENT DEFECT CATEGORIES

Rutting and Wear:

The extent of rutting is assumed to represent the entire length of the segment in the wheel path. The severity of rutting is recorded with a Yes in the Low, Medium, or High category. When the data is transferred to the database, the value of rutting is recorded in the LOW severity category only as either a 1=low, 2=med, or 3=high. Disregard any rutting that is localized or less than 100' in length.

Fatigue (Alligator) Cracking:

The extent of alligator cracking is measured as a percent of both wheel paths. Choose the predominant severity level of cracking that best represents the entire segment. Since alligator cracking is a percent wheel path measurement, the overall percentage in that segment could be the same even if the actual area covered by alligator cracking is different. *The wheel path covers ½ of the rated lane therefore it doesn't matter if the physical cracking was 1' wide or 5' wide at the same length. In addition, the whole width of the rated lane would be fully cracked if the actual defect extends to cover 2/3 or more of the total width.* Potholes or other occurrences of missing or destroyed pavement and temporary patching are included with alligator cracking.

Longitudinal Fatigue Cracking:

The extent of Longitudinal cracking is measured as a percentage of segment length for the entire area of the rated lane (including the center or paving joint of the road). Choose the predominant severity level of cracking that best represents the entire segment. The percent cracking may exceed 100% of the segment length. *There is no distinction between fatigue and non-fatigue related longitudinal cracking. Included is all cracking around utility structures and curb and gutter seems.*

Transverse Cracking:

The extent of transverse cracking is measured as counts per unit length. Choose the predominant severity level of cracking that best represents the entire segment. *Transverse cracks must be at least 2' in length to be considered.*

Raveling and (Aging or Weathering):

The extent of raveling is estimated and expressed relative to the total area of the rated lane. *Raveling is only collected on ACP surface roads.* Record the appropriate extent by using LOC, WHL, or LAN in the field that best represents the average condition of the segment.

Flushing/Bleeding: The extent of Flushing/Bleeding is estimated and expressed relative to the total area of the rated lane. Record the same as Raveling. Flushing/Bleeding can occur on both ACP and BST surface pavements.

Maintenance Patching: The extent of skin (chip seal) patch is measured as a percent of both wheel paths. Skin patching is measured the same as alligator cracking. *Any distresses that exist within the limits of the skin patch are also counted and recorded in the appropriate defect category. Grader, full depth, or utility patching is generally considered an improvement to the pavement condition and therefore not included in this defect category.*

Corrugation and Waves: *Identify only if the condition exists within the rated segment. Record Corrugation and Waves, on the rating form, with a Y or N. When the data is transferred to the database the value for Corrugation and Waves is a 1 in the low severity level if the condition is present.*

Sags and Humps: Same as Corrugation and Waves. *Sags and Humps are also used to quantify the existence of defects that do not fit the normal categories such as depressions or tree roots.*

Pavement Edge Condition: The extent of Edge Raveling is measured as a percentage of the segment length. *When edge raveling exists in combination with alligator cracking both defects are counted.* ***Temporary*** *edge patching is included with alligator cracking. Permanent Edge Patching and Edge Lane Less than 10' are not included in this category.*

Crack Seal Condition: *This distress is collected for inventory purposes only. Identify if cracks in the segment are sealed or not. Y=sealed and N=not sealed. Choose the predominant condition to determine if the segment has crack seal or not. If crack seal exists in the segment and the seal has opened or pulled away from the crack it is not sealed. Treat the underlying cracks below the seal as if there were no seal at all.*

In the future we are looking at making changes to the way we collect our distress data. Examples of which might be rating 100% of the road surface, separating Fatigue and Non-Fatigue Longitudinal cracking, and measuring the actual area of distress.